

## GEPHE SUMMARY

	Gephebase Gene	GephelD
para (kdr) ( <a href="https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene Gephebase='para (kdr)'#gephebase-summary-title</a> )	GP00002511	Main curator
Published	Entry Status	Courtier

## PHENOTYPIC CHANGE

	Trait Category	
Physiology ( <a href="https://www.gephebase.org/search-criteria?/and+Trait Category='Physiology'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait Category='Physiology'#gephebase-summary-title</a> )	Trait	
Xenobiotic resistance (insecticide) ( <a href="https://www.gephebase.org/search-criteria?/and+Trait='Xenobiotic resistance (insecticide)'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait='Xenobiotic resistance (insecticide)'#gephebase-summary-title</a> )	Trait State in Taxon A	
Bemisia tabaci	Trait State in Taxon B	
Bemisia tabaci - resistant	Ancestral State	
Taxon A	Taxonomic Status	
Intraspecific ( <a href="https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic Status='Intraspecific'#gephebase-summary-title</a> )		
Taxon A	Latin Name	Taxon B
Bemisia tabaci ( <a href="https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Bemisia tabaci'#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms='Bemisia tabaci'#gephebase-summary-title</a> )		Latin Name
-	Common Name	
Aleyrodes tabaci; sweet potato whitefly; Bemisia tabaci (Gennadius, 1889)	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Paraneoptera; Hemiptera; Sternorrhyncha; Aleyrodoidea; Aleyrodidae; Aleyrodinae; Bemisia	Lineage	
Bemisia () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7037">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7037</a> )	Parent	
7038 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7038">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7038</a> )	NCBI Taxonomy ID	
No	is Taxon A an Infraspecies?	
	No	is Taxon B an Infraspecies?

## GENOTYPIC CHANGE

	Generic Gene Name		
para	Synonyms	UniProtKB Drosophila melanogaster	
bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]; I(1)14Da; I(1)ESHS48; lincRNA.S9469; Nav1; Ocd; olfD; par; sbl; sbl-1; Shu; Shudderer	String	P35500 ( <a href="http://www.uniprot.org/uniprot/P35500">http://www.uniprot.org/uniprot/P35500</a> )	GenebankID or UniProtKB
7227.FBpp0303597 ( <a href="http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0303597">http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0303597</a> )	Sequence Similarities	CAD29438 ( <a href="https://www.ncbi.nlm.nih.gov/nuccore/CAD29438">https://www.ncbi.nlm.nih.gov/nuccore/CAD29438</a> )	
Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily.	GO - Molecular Function		
GO:0005509 : calcium ion binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005509">https://www.ebi.ac.uk/QuickGO/term/GO:0005509</a> )			
GO:0005244 : voltage-gated ion channel activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005244">https://www.ebi.ac.uk/QuickGO/term/GO:0005244</a> )			
GO:0005248 : voltage-gated sodium channel activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005248">https://www.ebi.ac.uk/QuickGO/term/GO:0005248</a> )			
GO:0005272 : sodium channel activity			

GO - Biological Process

GO:0045433 : male courtship behavior, veined wing generated song production  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0045433>)  
 GO:0001666 : response to hypoxia (<https://www.ebi.ac.uk/QuickGO/term/GO:0001666>)  
 GO:0009612 : response to mechanical stimulus  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0009612>)  
 GO:0034765 : regulation of ion transmembrane transport  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)  
 GO:0035725 : sodium ion transmembrane transport  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0035725>)  
 GO:0007638 : mechanosensory behavior  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0007638>)  
 GO:0060078 : regulation of postsynaptic membrane potential  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0060078>)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)  
 GO:0001518 : voltage-gated sodium channel complex  
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0001518>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%No%#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%Coding%#gephebase-summary-title>)

Aberration Type

SNP (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%SNP%#gephebase-summary-title>)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

T929V

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%Candidate+Gene%#gephebase-summary-title>)

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

Next-generation molecular diagnostics (TaqMan qPCR and ddPCR) for monitoring insecticide resistance in *Bemisia tabaci*. (2022) (<https://pubmed.ncbi.nlm.nih.gov/36054028>)

Authors

Mavridis K; Papapostolou KM; Ilias A; Michaelidou K; Stavrakaki M; Roditakis E; Tsagkarakou A; Bass C; Vontas J

Abstract

Insecticide resistance has developed in several populations of the whitefly *Bemisia tabaci* worldwide and threatens to compromise the efficacy of chemical control. The molecular mechanisms underpinning resistance have been characterized and markers associated with the trait have been identified, allowing the development of diagnostics for individual insects.

TaqMan and Droplet Digital PCR (ddPCR) assays were developed and validated, in individual and pooled whitefly samples, respectively, for the following target-site mutations: the acetylcholinesterase (ace1) F331W mutation conferring organophosphate-resistance; the voltage-gated sodium channel (vgsc) mutations L925I and T929V conferring pyrethroid-resistance; and the acetyl-CoA carboxylase (acc) A2083V mutation conferring ketoenol-resistance. The ddPCR's limit of detection (LoD) was <0.2% (i.e. detection of one heterozygote whitefly in a pool of 249 wild-type individuals). The assays were applied in 11 *B. tabaci* field populations from four locations in Crete, Greece. The F331W mutation was detected to be fixed or close to fixation in eight of 11 *B. tabaci* populations, and at lower frequency in the remaining ones. The pyrethroid-resistance mutations were detected at very high frequencies. The A2083V spiromesifen resistance mutation was detected in eight of 11 populations (frequencies = 6.16–89.56%). Spiromesifen phenotypic resistance monitoring showed that the populations tested had variable levels of resistance, ranging from full susceptibility to high resistance. A strong spiromesifen-resistance phenotype-genotype (A2083V) correlation ( $r = -0.839$ ,  $P = 0.002$ ) was observed confirming the ddPCR diagnostic value.

The ddPCR diagnostics developed in this study are a valuable tool to support evidence-based rational use of insecticides and resistance management strategies. © 2022 Society of Chemical Industry.

© 2022 Society of Chemical Industry.

Additional References

Mutations in DIIS5 and the DIIS4-S5 linker of *Drosophila melanogaster* sodium channel define binding domains for pyrethroids and DDT. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17991435>)  
 Molecular biology of insect sodium channels and pyrethroid resistance. (2014) (<https://pubmed.ncbi.nlm.nih.gov/24704279>)

## RELATED GEPHE

Related Genes

5 (acetyl-CoA carboxylase (ACC), Acetylcholinesterase (Ace-1), Acetylcholinesterase (Ace-2), CYP6CM1, resistance to dieldrin) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%7038%/and+Trait=Xenobiotic+resistance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

2 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%7038%/or+Gene+Gephebase=%para+\(kdr\)%/and+Taxon+ID=%7038%#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%7038%/or+Gene+Gephebase=%para+(kdr)%/and+Taxon+ID=%7038%#gephebase-summary-title))

[EXTERNAL LINKS](#)

[COMMENTS](#)